User´s Manual

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RH850 Evaluation Platform

RH850/F1H 233-pin PiggyBack Board V1

RH850-F1X-233PIN-PB-T1-V1

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Chapter 1 Introduction

The RH850/F1x Application Board is part of the RH850 Evaluation Platform and serves as a simple and easy to use platform for evaluating the features and performance of Renesas Electronics 32-bit RH850/F1x microcontrollers.
The piggyback board (RH850-F1X-233PIN-PB-T1-V1) can be used as a standalone board, or can be mated with a mainboard (e.g. RH850-X1X-MB-T1-V1) for extended functionality.

Main features:

- Socket for mounting of device
- Standalone operation of the board
- Direct supply of device voltage (typ. 3.3V-5.0V)
- Device programming capability
- Device debugging capability
- Pin headers for direct access to each device pin
- Reset switch
- MainOSC and SubOSC circuitry
- Connectors to MainBoard

This document describes the functionality provided by the piggyback board and guides the user through its operation.

For details regarding the operation of the microcontroller, refer to the RH850/F1H User Manual.

Chapter 2 Overview

2.1 Overview

Figures 1 and 2 provide the views of the Piggyback Board.

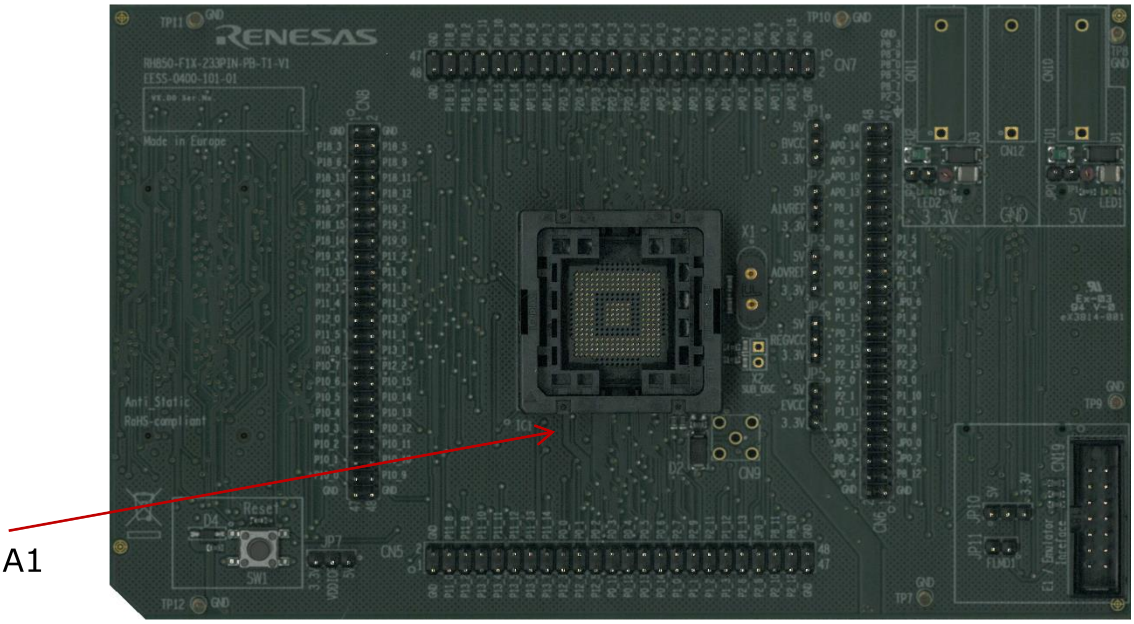


Figure 1 – PiggyBoard top view

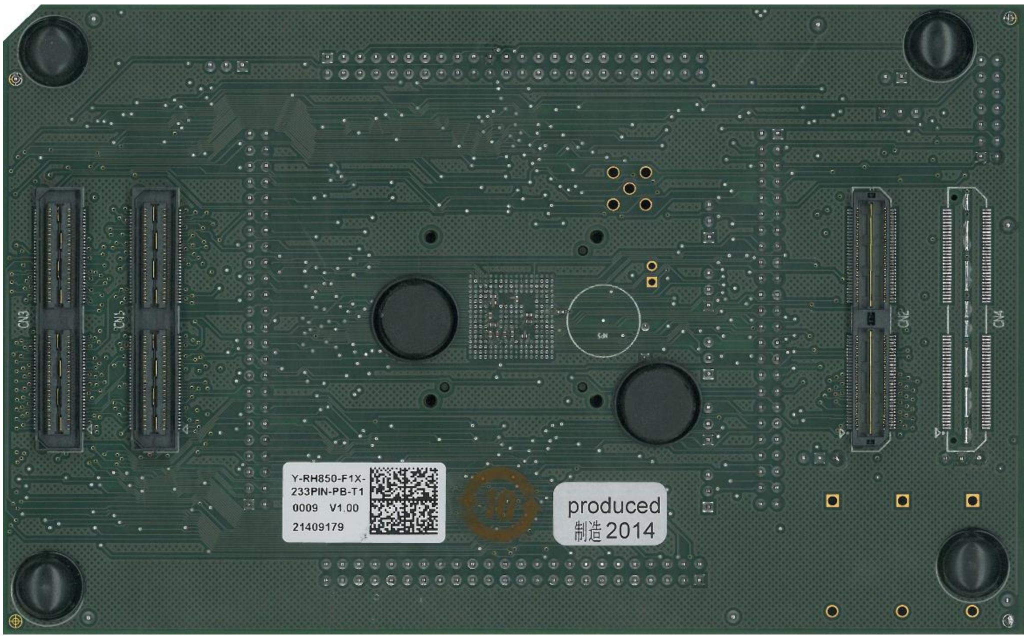


Figure 2 – PiggyBoard bottom view

2.2 Mounting of the device

The board is designed for use with the following devices:

- RH850/F1H-233

The device must be placed inside the socket IC1. To insert the device, press down the lid, align the #A1 pin of the device to the #A1pin of the socket, insert the device inside the socket and release the lid.

Chapter 3 Power supply

3.1 Board power connection

For operation of the device, a supply voltage must be connected to the board. Though a single supply voltage is sufficient for the operation of the device, two (different) voltages can be supplied to the board.

Within this document the following voltages are considered as 'typical' connections:

Voltage1 = 5.0V

Voltage2 = 3.3V

The following connectors are available to supply those voltages:

- Three 4mm 'banana-type' connectors:
    - Two red connectors for voltages *Voltage1* (CN10) and *Voltage2* (CN11).
    - A black connector for GND connection (CN12).

  Note: The three connectors are supplied with the board but not assembled.
- The E1 emulator that is used for debug purposes and flash programming can also supply a single operating voltage ('Dbg_Voltage').
  The voltage is programmable via the E1 GUI as 3.3 or 5.0V (typ).
  See the documentation of the E1 and chapter 5 'Debug and Programming interface' for details.
- In case the PiggyBoard is mounted on a MainBoard, the voltages *Voltage1* and *Voltage2* are supplied by the on-board regulators of the MainBoard.

NOTE: *Do not supply any voltage directly to the PiggyBoard in case it is mounted on the MainBoard.*

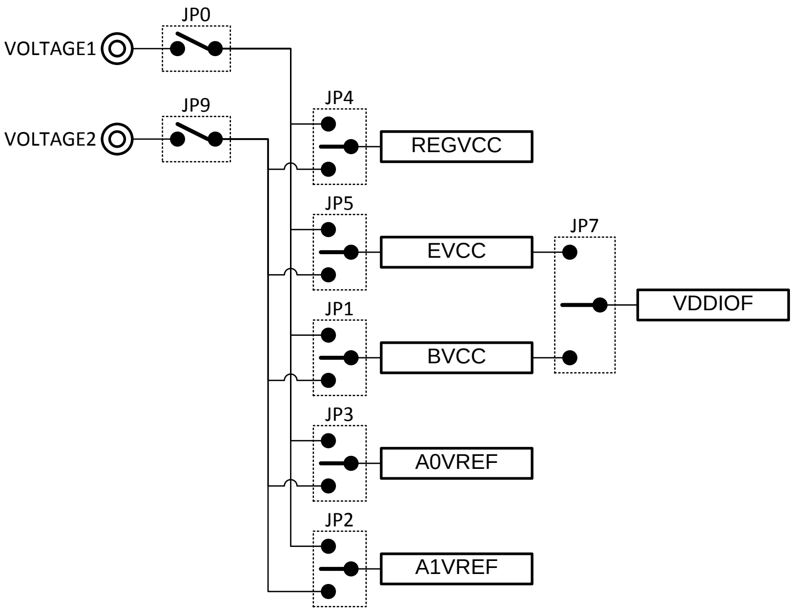
For each of the two voltages, 'Voltage 1 ' and 'Voltage 2', a green LED (LED1 and LED2) is available to signal that the related voltage is available on the PiggyBoard.

3.2 Voltage distribution

The table shows the required device power supply pins and their function:

Device supply pin	Function
REGVCC	Supply for the device internal regulators for the digital logic.
EVCC	Supply for ports.
BVCC	Supply for ports.
A0VREF	Supply for ports and analog functions of ADC0.
A1VREF	Supply for ports and analog functions of ADC1.

- For each of the above voltages, the voltage source can be selected from *Voltage1* (typ. 5.0V) or *Voltage2* (typ. 3.3V) by the jumpers JP0 and JP9.
- The IO supply voltage for the Mainboard can be selected via jumper JP7 from either the EVCC or the BVCC supply voltage.



Chapter 4 Clock sources

Three external crystal oscillators for the device clock supply are provided with the board.

4.1.1 MainOsc

A crystal or ceramic resonator in the range of 8MHz to 24MHz can be mounted on socket X1.

A 8MHz and a 16Mhz oscillator is supplied with the board.

4.1.2 SubOSC

An oscillator with a frequency of 32.768kHz is supplied with the board and can be soldered into the connector X2.

Chapter 5 Debug and Programming interface

For connection of the microcontroller debug and flash programming tools, the connector CN19 is provided.

The signal connection of the connector CN19 is shown in the picture below:

CN19 pin	Device Port	Device signal
1	JP0_2	DCUTCK / LPDCLK
2	GND	GND
3	JP0_4	DCUTRST
4	FLMD0	FLMD0
5	JP0_1	DCUTDO / LPDO
6	-	-
7	JP0_0	DCUTDI / LPDI
8	'Dbg_Voltage'	-
9	JP0_3	DCUTMS
10	-	-
11	JP0_5	DCURDY / LPDCLKOUT
12	GND	-
13	RESET	-
14	GND	-

In case the FLMD1 signal must be controlled by the debug/programming tool, the pin header JP11 must be closed.

The 'Dbg_Voltage' (on CN19 pin 8) is monitored or supplied by the debug and flash programming tools. Therefore, it is necessary to select either Voltage1 (5V) or the Voltage2 (3.3V) by pin header JP10:

JP10 pin	Selection for Dbg_Voltage
1-2	5V is selected
2-3	3.3V is selected

Chapter 6 Connectors for ports of device

Connection to each pin of the device is possible via the connectors CN5 to CN8.

Note :The pin headers are directly connected to the pins, therefore special care must be taken to avoid any electrostatic or other damage to the device.

6.1 Push button for RESET

In order to issue a RESET to the device, the push-button SW1 is available.

6.2 Connectors to MainBoard

Three connectors (CN1 to CN3) are available to connect the PiggyBoard to a MainBoard.

The signal connection of each connector is described in the following tables:

6.2.1 Connector CN1

Pin	Function	Device Port		Pin	Function	Device Port
1	VOLTAGE1	-		2	VOLTAGE1	-
3	VOLTAGE1	-		4	VOLTAGE1	-
5	RESET	_RESET		6	NMI	P9_0
7	WAKE	-		8	-	-
9	INT0	P9_1		10	INT1	P0_6
11	INT2	P9_2		12	INT3	P9_3
13	-	-		14	-	-
15	UART0TX	P10_10		16	UART1TX	P0_5
17	UART0RX	P10_9		18	UART1RX	P0_4
19	LIN0TX	P10_10		20	LIN1TX	P0_8
21	LIN0RX	P10_9		22	LIN1RX	P0_7
23	IIC0SDL	P10_3		24	IIC1SDL	-
25	IIC0SDA	P10_2		26	IIC1SDA	-
27	CAN0TX	P10_1		28	CAN1TX	P0_3
29	CAN0RX	P10_0		30	CAN1RX	P0_2
31	SENTIN0	-		32	SENTIN1	-
33	SENTOUT0	-		34	SENTOUT1	-
35	PSI50Rx	-		36	PSI51Rx	-
37	PSI50Tx	-		38	PSI51Tx	-
39	PSI50Snyc	-		40	PSI51Sync	-
41	FLX0TX	P11_1		42	FLX0EN	P10_11
43	FLX0RX	P10_14		44	FLXSTPWT	P10_12
45	FLX1TX	P10_8		46	FX1EN	P10_13

47	FLX1RX	P10_9		48	FX1CLK	P10_10
49	-	-		50	-	-
51	ETH0MDIO	P12_4		52	ETH0MDC	P12_5
53	ETH0RXD0	P10_1		54	EH0TXD0	P18_1
55	ETH0RXD1	P10_2		56	EH0TXD1	P18_2
57	ETH0RXD2	P10_4		58	EH0TXD2	P18_3
59	ETH0RXD3	P10_5		60	EH0TXD3	P18_4
61	ETH0RXDCLK	P10_0		62	ETH0TXCLK	P18_7
63	ETH0RXER	P11_14		64	ETH0TXER	P18_6
65	ETH0CRSDV	P11_13		66	ETH0TXEN	P18_5
67	ETH0RXDV	P11_11		68	ETH0COL	P11_10
69	ETH0RESET	P2_6		70	ETH0LINK	P18_0
71	-	-		72	-	-
73	USB0UDMF	-		74	USB0UDMH	-
75	USB0UDPF	-		76	USB0UDPH	-
77	-	-		78	-	-
79	-	-		80	-	-
81	-	-		82	-	-
83	-	-		84	-	-
85	DIGIO_0	P8_0		86	DIGIO_1	P8_1
87	DIGIO_2	P8_2		88	DIGIO_3	P8_3
89	DIGIO_4	P8_4		90	DIGIO_5	P8_5
91	DIGIO_6	P8_6		92	DIGIO_7	P11_0
93	DIGIO_8	P10_0		94	DIGIO_9	P10_7
95	DIGIO_10	P10_8		96	DIGIO_11	P10_15
97	DIGIO_12	P0_9		98	DIGIO_13	P0_10
99	DIGIO_14	P0_11		100	DIGIO_15	P0_12
101	-	-		102	-	-
103	MUX0	P10_4		104	MUX1	P10_5
105	MUX2	P10_6		106	-	-
107	ADC0	AP0_0		108	ADC1	AP0_1
109	ADC2	AP0_2		110	ADC3	AP0_3
111	ADC4	AP0_4		112	ADC5	AP0_5
113	ADC6	AP0_6		114	ADC7	AP0_7
115	-	-		116	-	-
117	VOLTAGE2	-		118	VOLTAGE2	-
119	VOLTAGE2	-		120	VOLTAGE2	-

6.2.2 Connector CN2

Pin	Function	Device Port		Pin	Function	Device Port
1	CAN2Tx	P12_0		2	CAN3Tx	P1_3
3	CAN2Rx	P11_15		4	CAN3Rx	P1_2
5	CAN4Tx	P1_13		6	CAN5Tx	P11_6
7	CAN4Rx	P1_12		8	CAN5Rx	P11_5
9	LIN2Tx	P0_10		10	LIN3Tx	P1_15
11	LIN2Rx	P0_9		12	LIN3Rx	P1_14
13	LIN4Tx	P1_11		14	LIN5Tx	P1_7
15	LIN4Rx	P1_10		16	LIN5Rx	P1_6
17	LIN6Tx	P0_12		18	LIN7Tx	P12_4
Q	LIN6Rx	P0_11		20	LIN7Rx	P12_3
21	LIN8Tx	P2_3		22	LIN9Tx	P2_5
23	LIN8Rx	P2_2		24	LIN9Rx	P2_4
25	LIN10Tx	P10_10		26	LIN11Tx	P0_5
27	LIN10Rx	P10_9		28	LIN11Rx	P0_4
29	LIN12Tx	P0_14		30	LIN13Tx	P1_1
31	LIN12Rx	P0_13		32	LIN13Rx	P1_0
33	LIN14Tx	P1_9		34	LIN15Tx	P1_5
35	LIN14Rx	P1_8		36	LIN15Rx	P1_4
37	-	-		38	-	-
39	-	-		40	-	-
41	MLBCLK	-		42	MLBRESET	-
43	MLBSIG	-		44	MLBDAT	-
45	-	-		46	-	-
47	CAN6Tx	P20_1		48	CAN7Tx	P20_5
49	CAN6Rx	P20_0		50	CAN7Rx	P20_4
51	-	-		52	-	-
53	-	-		54	-	-
55	-	-		56	-	-
57	-	-		58	-	-
59	-	-		60	-	-
61	-	-		62	-	-
63	-	-		64	-	-
65	-	-		66	-	-
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71	-	-		72	-	-
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79	-	-		80	-	-

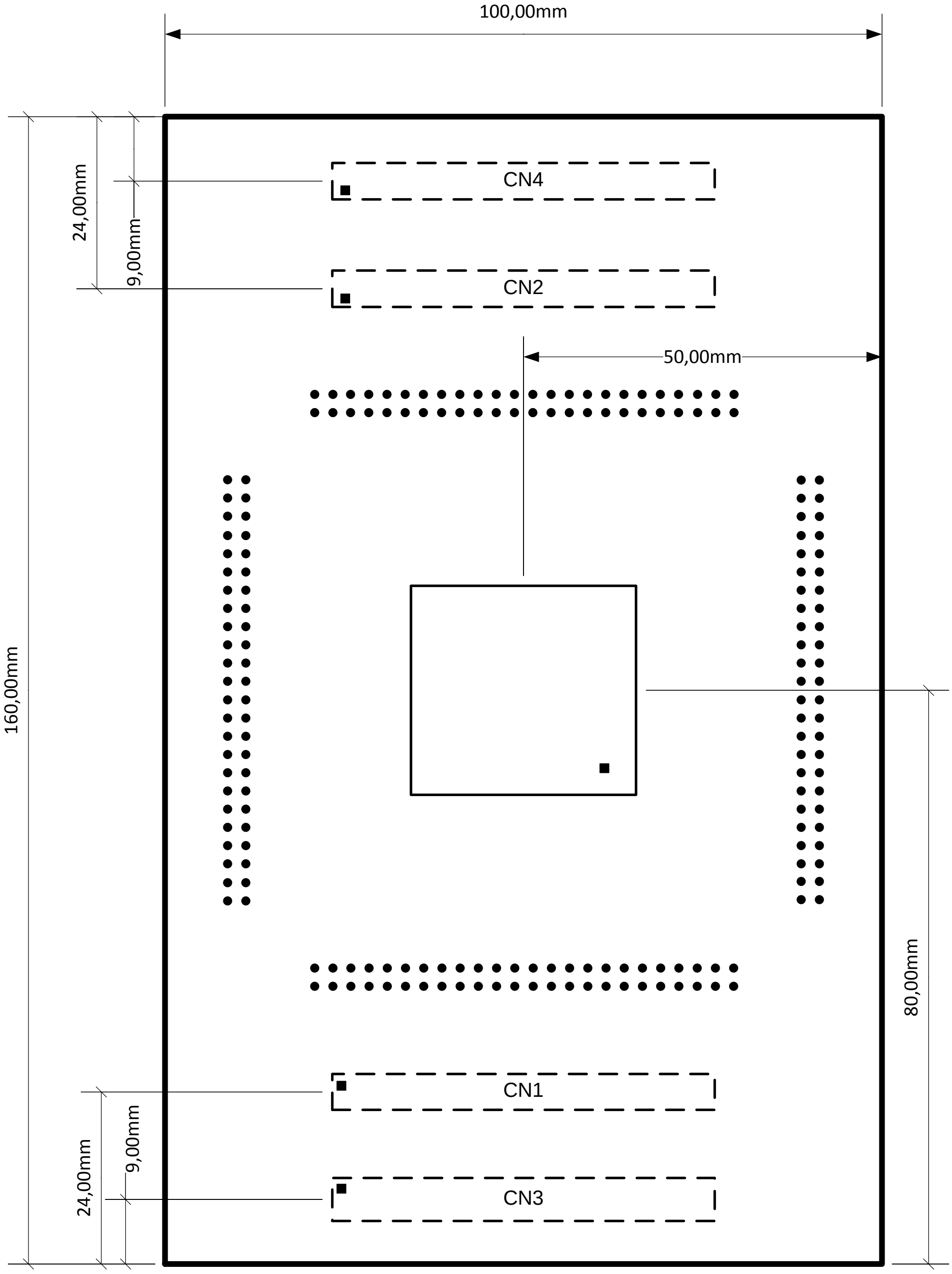
81	-	-	82	-	-
83	-	-	84	-	-
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91	-	-	92	-	-
93	-	-	94	-	-
95	-	-	96	-	-
97	-	-	98	-	-
99	-	-	100	-	-
101	-	-	102	-	-
103	-	-	104	-	-
105	-	-	106	-	-
107	-	-	108	-	-
109	-	-	110	-	-
111	-	-	112	-	-
113	-	-	114	-	-
115	-	-	116	-	-
117	-	-	118	-	-
119	-	-	120	-	-

6.2.3 Connector CN3

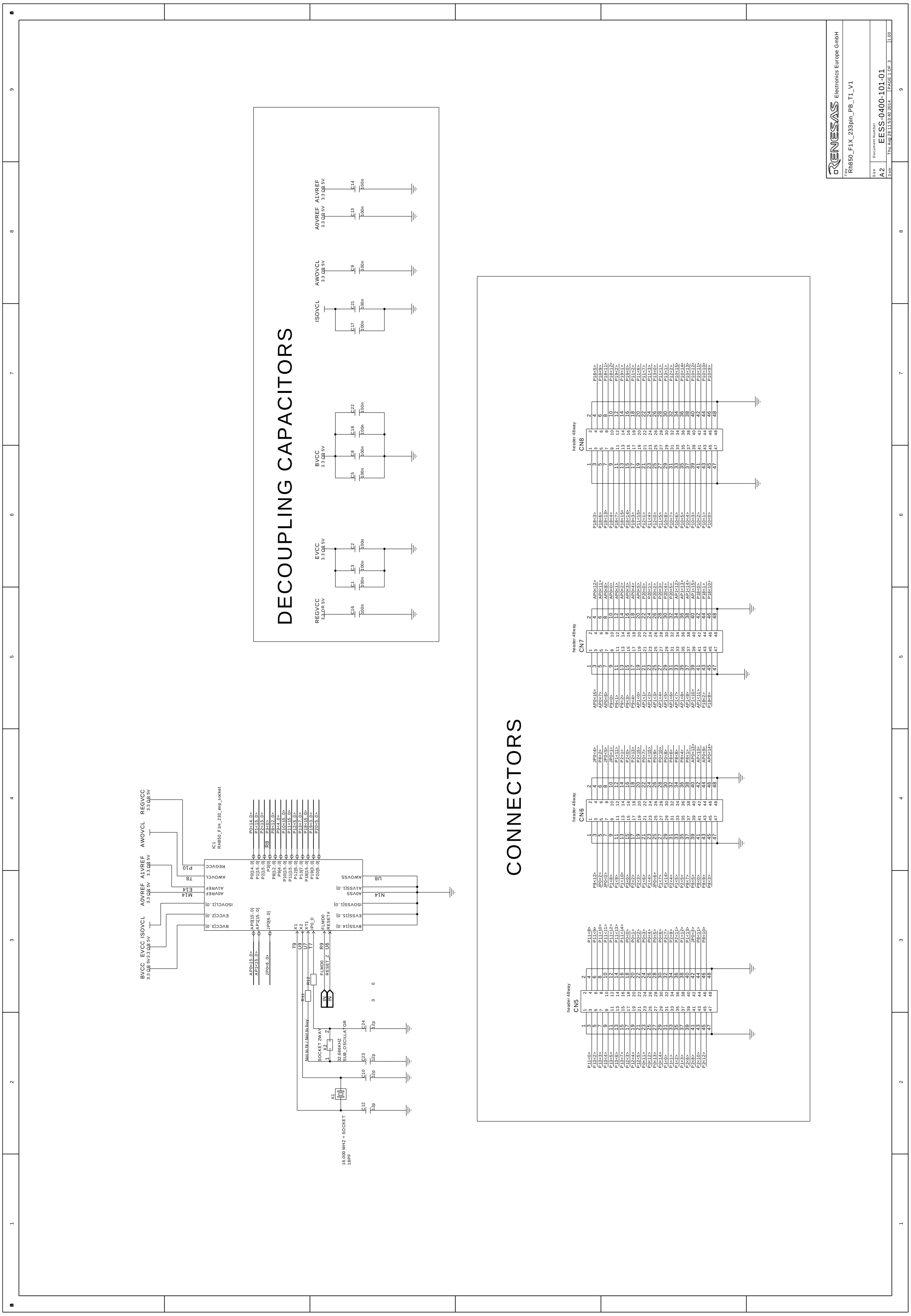
Pin	Function	Device Port	Pin	Function	Device Port
1	PWM00	P10_0	2	PWM01	P10_1
3	PWM02	P10_2	4	PWM03	P10_3
5	PWM04	P10_7	6	PWM05	P10_8
7	PWM06	P10_9	8	PWM07	P10_10
9	PWM08	P9_0	10	PWM09	P9_1
11	PWM10	P0_4	12	PWM11	P0_1
13	PWM12	P0_2	14	PWM13	P0_3
15	PWM14	P8_0	16	PWM15	P8_1
17	PWM16	P10_11	18	PWM17	P10_12
Q	PWM18	P10_13	20	PWM19	P10_14
21	PWM20	P9_2	22	PWM21	P9_3
23	PWM22	P8_2	24	PWM23	P8_3
25	PWM24	P10_15	26	PWM25	P11_0
27	PWM26	P11_1	28	PWM27	P11_2
29	PWM28	P11_3	30	PWM29	P11_4
31	PWM30	P11_5	32	PWM31	P11_6
33	PWM32	P11_7	34	PWM33	P9_4
35	PWM34	P0_11	36	PWM35	P0_6

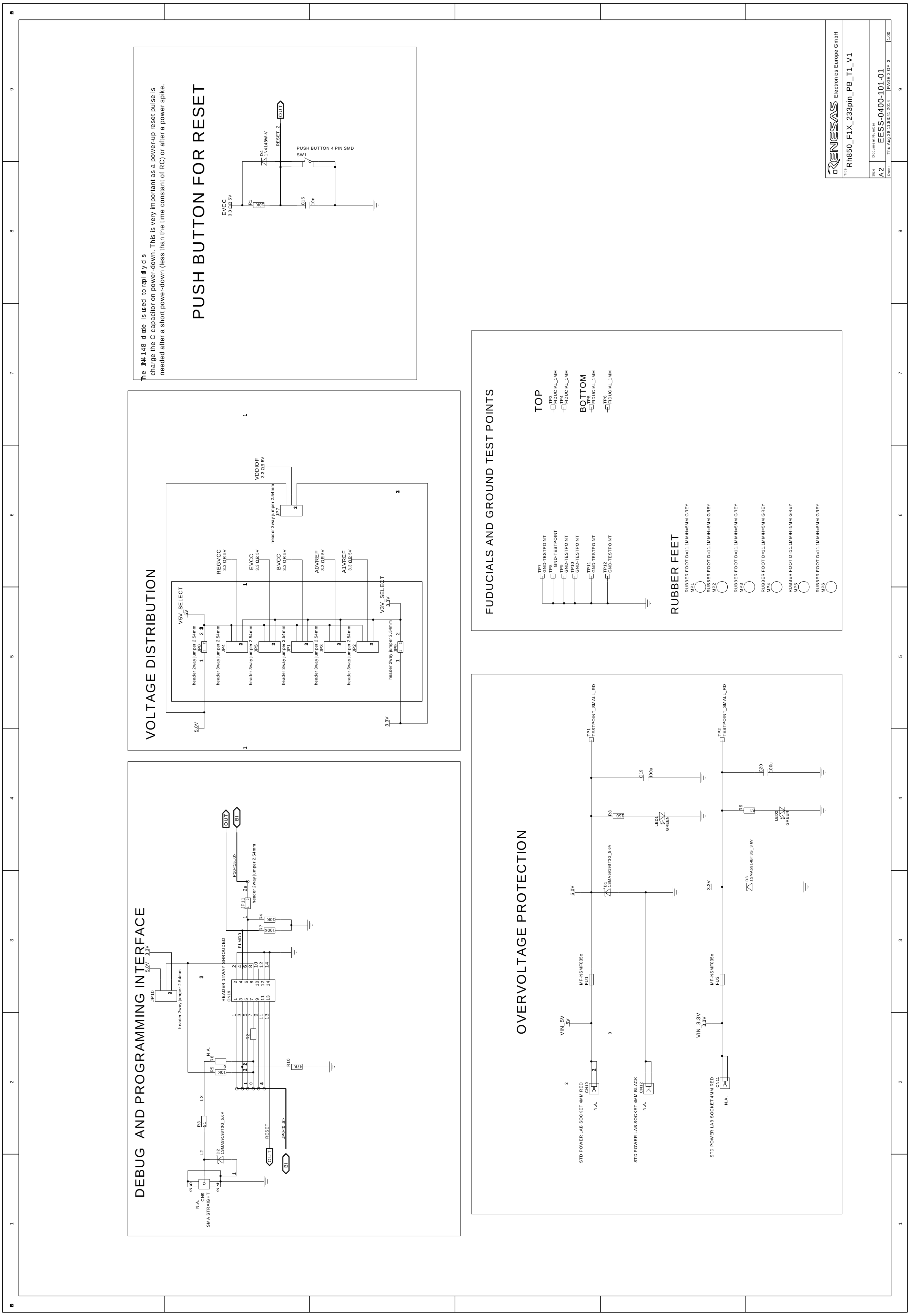
37	PWM36	P8_4	38	PWM37	P8_5
39	PWM38	P8_6	40	PWM39	P8_7
41	PWM40	P8_8	42	PWM41	P8_9
43	PWM42	P8_10	44	PWM43	P8_11
45	PWM44	P8_12	46	PWM45	P0_12
47	PWM46	P0_13	48	PWM47	P0_14
49	PWM48	P11_8	50	PWM49	P11_9
51	PWM50	P11_10	52	PWM51	P11_11
53	PWM52	P11_12	54	PWM53	P11_13
55	PWM54	P11_14	56	PWM55	P11_15
57	PWM56	P12_0	58	PWM57	P12_1
59	PWM58	P12_2	60	PWM59	P20_4
61	PWM60	P20_5	62	PWM61	P18_0
63	PWM62	P18_1	64	PWM63	P18_2
65	PWM64	P20_0	66	PWM65	P20_1
67	PWM66	P20_2	68	PWM67	P20_3
69	PWM68	P12_3	70	PWM69	P12_4
71	PWM70	P12_5	72	PWM71	P18_3
73	PWM72	P13_6	74	PWM73	P13_7
75	PWM74	P2_14	76	PWM75	P2_15
77	PWM76	P3_0	78	PWM77	P2_9
79	PWM78	P2_10	80	PWM79	P2_11
81	PWMADC00	AP0_8	82	PWMADC01	AP0_9
83	PWMADC02	AP0_10	84	PWMADC03	AP0_11
85	PWMADC04	AP0_12	86	PWMADC05	AP0_13
87	PWMADC06	AP0_14	88	PWMADC07	AP0_15
89	PWMADC08	AP1_0	90	PWMADC09	AP1_1
91	PWMADC10	AP1_2	92	PWMADC11	AP1_3
93	PWMADC12	AP1_4	94	PWMADC13	AP1_5
95	PWMADC14	AP1_6	96	PWMADC15	AP1_7
97	-	-	98	-	-
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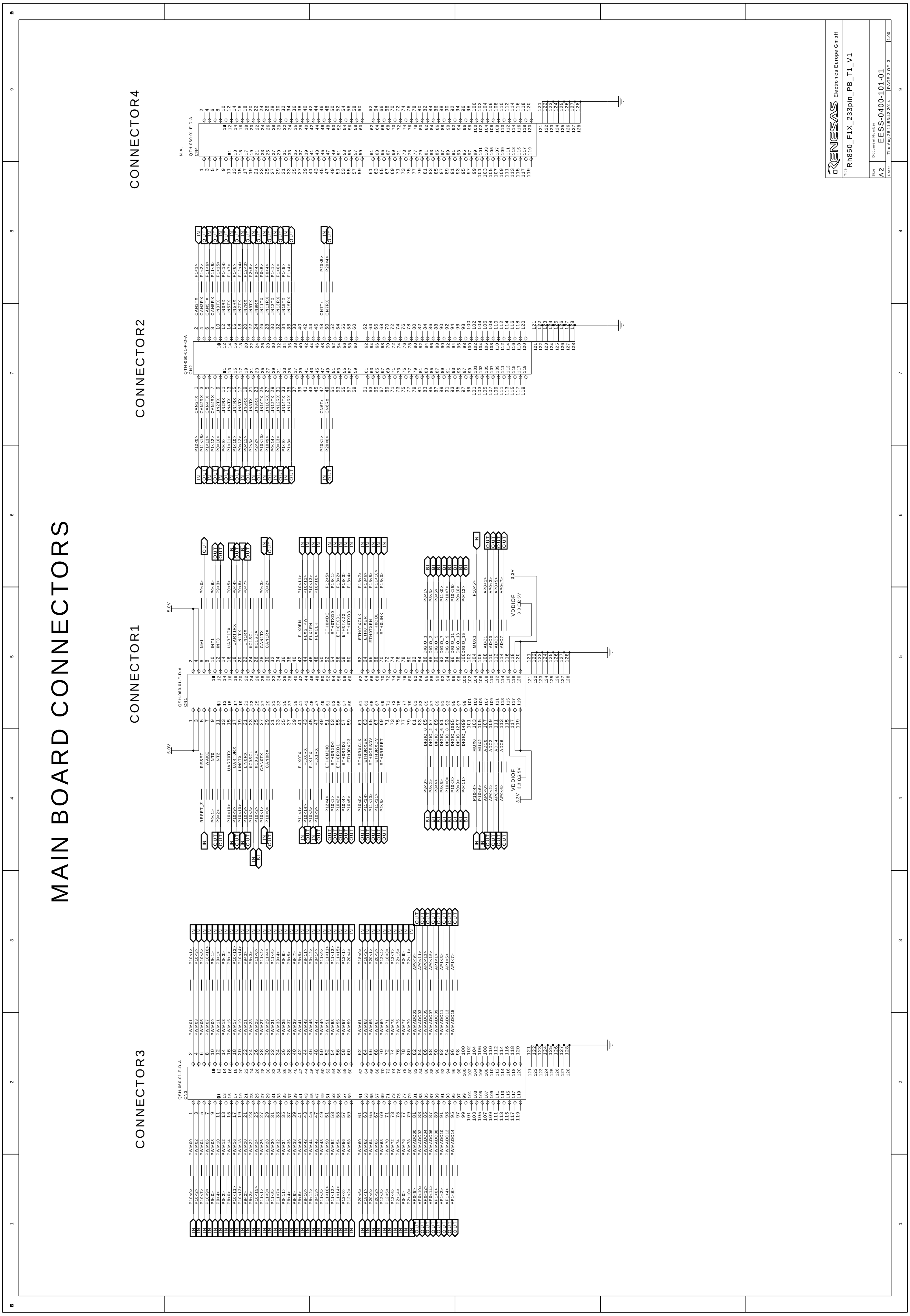
Chapter 7 Mechanical dimensions



Chapter 8 Schematic




PUSH BUTTON FOR RESET
The 1N4148 diode is used to rapidly discharge the C capacitor on power-down. This is very important as a power-up reset pulse is needed after a short power-down (less than the time constant of RC) or after a power spike.
VOLTAGE DISTRIBUTION
DEBUG AND PROGRAMMING INTERFACE
FUDUCIALS AND GROUND TEST POINTS
TOP
BOTTOM
RUBBER FEET
OVERVOLTAGE PROTECTION
Electronics Europe GmbH
Rh850_F1X_233pin_PB_T1_V1
EESS-0400-101-01
A2


MAIN BOARD CONNECTORS
CONNECTOR1
CONNECTOR2
CONNECTOR3
CONNECTOR4
Rh850_F1X_233pin_PB_T1_V1
EESS-0400-101-01

Chapter 9 Revision History

The table provides information about the major changes of the document versions.

Date	Version	Description
2014-11-18	1.0	Initial release

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